US009299511B2

(12) **United States Patent**
Yeh et al.

(10) **Patent No.: US 9,299,511 B2**
(45) **Date of Patent: Mar. 29, 2016**

(54) **KEY ASSEMBLY AND ELECTRONIC DEVICE**

(71) Applicant: **HTC Corporation**, Taoyuan County (TW)

(72) Inventors: **Han-Wen Yeh**, Taoyuan County (TW); **I-Cheng Chuang**, Taoyuan County (TW)

(73) Assignee: **HTC Corporation**, Taoyuan (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 55 days.

(21) Appl. No.: **14/290,993**

(22) Filed: **May 30, 2014**

(65) **Prior Publication Data**

US 2015/0348724 A1 Dec. 3, 2015

(51) **Int. Cl.**
H01H 13/14 (2006.01)
H01H 13/06 (2006.01)
H01H 13/10 (2006.01)

(52) **U.S. Cl.**
CPC ***H01H 13/14*** (2013.01); ***H01H 13/06*** (2013.01); ***H01H 13/10*** (2013.01); *H01H 2203/00* (2013.01); *H01H 2211/00* (2013.01); *H01H 2221/03* (2013.01); *H01H 2221/044* (2013.01); *H01H 2223/002* (2013.01)

(58) **Field of Classification Search**
CPC H01H 13/06; H01H 3/02; H01H 13/14
USPC ..... 200/16 R, 302.2–302.3, 341, 520, 530
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,007,347 A * 2/1977 Haber ..... G04C 3/005 200/52 R
6,570,105 B1 * 5/2003 Sallam ..... H01H 25/06 200/1 R
6,642,920 B2 11/2003 Osawa et al.
6,717,082 B1 4/2004 Wu
6,910,439 B2 * 6/2005 Baba B60K 37/02 116/62.1

FOREIGN PATENT DOCUMENTS

CN	102543497	7/2012
JP	H08273477	10/1996
TW	M359055	6/2009
TW	201137909	11/2011

OTHER PUBLICATIONS

"Notice of Allowance of Taiwan Counterpart Application", issued on Apr. 14, 2015, p. 1-p. 3.

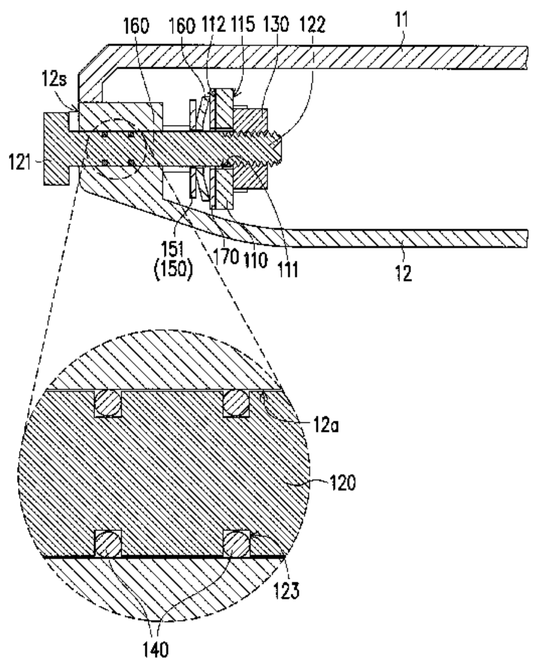
* cited by examiner

Primary Examiner — Edwin A. Leon
Assistant Examiner — Iman Malakooti
(74) *Attorney, Agent, or Firm* — Jianq Chyun IP Office

(57) **ABSTRACT**

A key assembly and electronic device is provided. The key assembly is disposed at a housing of the electronic device. The key assembly includes a circuit board, a shaft, a limiting portion, a contact element and an elastic element. The circuit board disposed in the housing has a first contact and a second contact. The shaft penetrates through the housing and the circuit board and having a first end and a second end. The limiting portion is located at the second end of the shaft. The contact element is located between the housing and the circuit board. The elastic element is coupled between the shaft and the circuit board. When the shaft drives the contact element to move toward the circuit board for the contact element to contact the second contact, the second contact is electrically connected to the first contact through the contact element to generate an electrical signal.

20 Claims, 5 Drawing Sheets



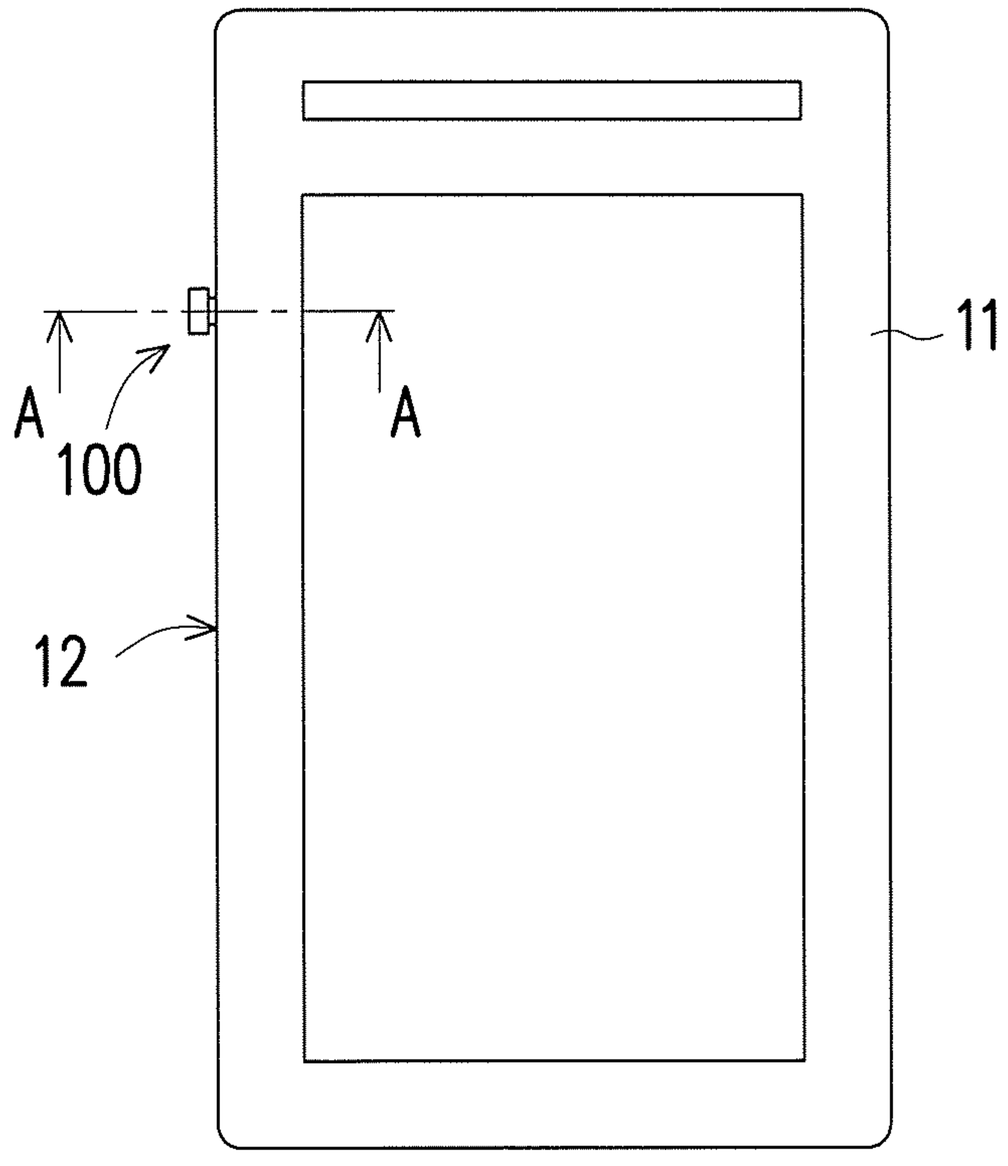


FIG. 1

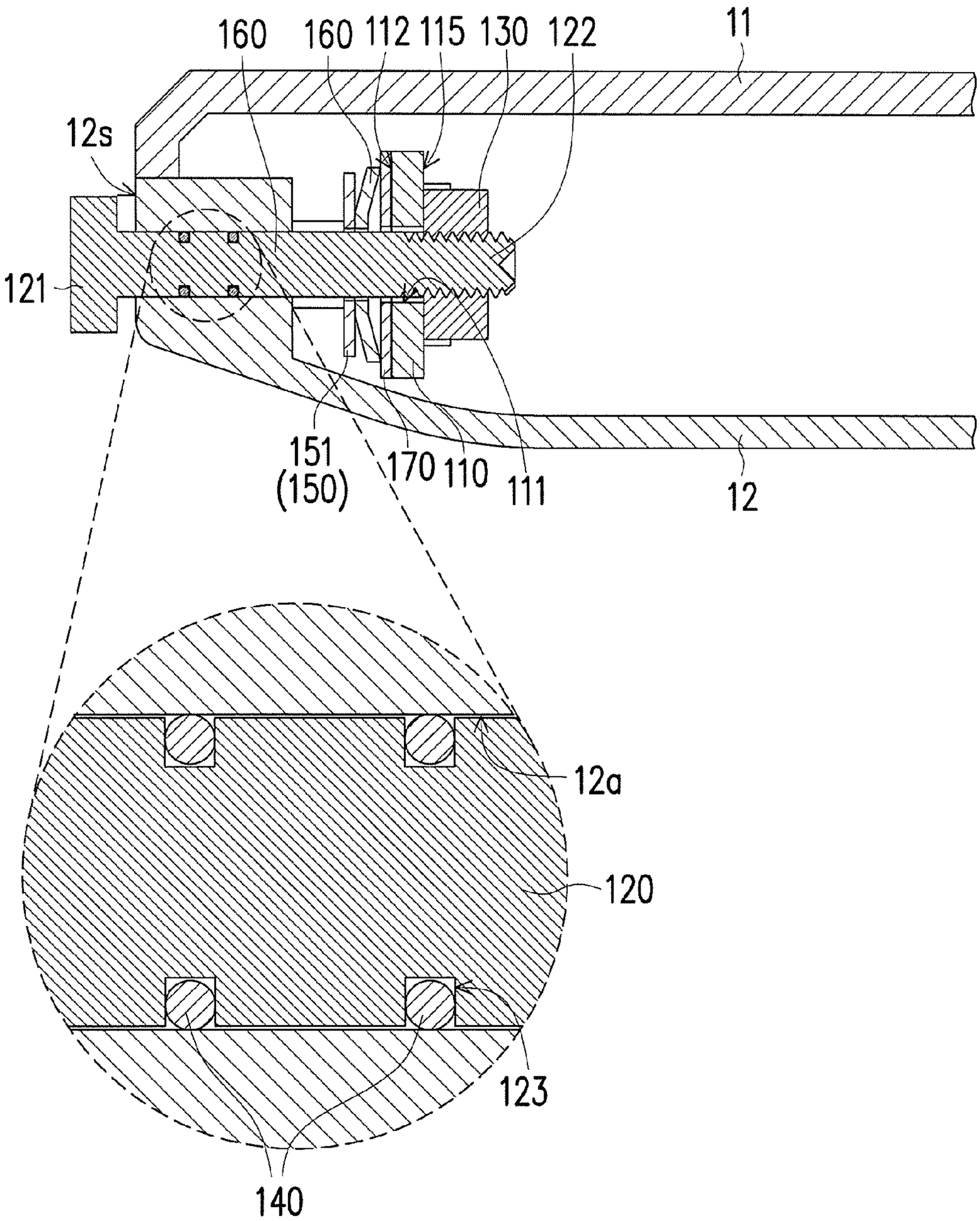

160
160
112
115
130
122
11
12s
121
151
(150)
170
110
111
12
12a
120
123
140

FIG. 2

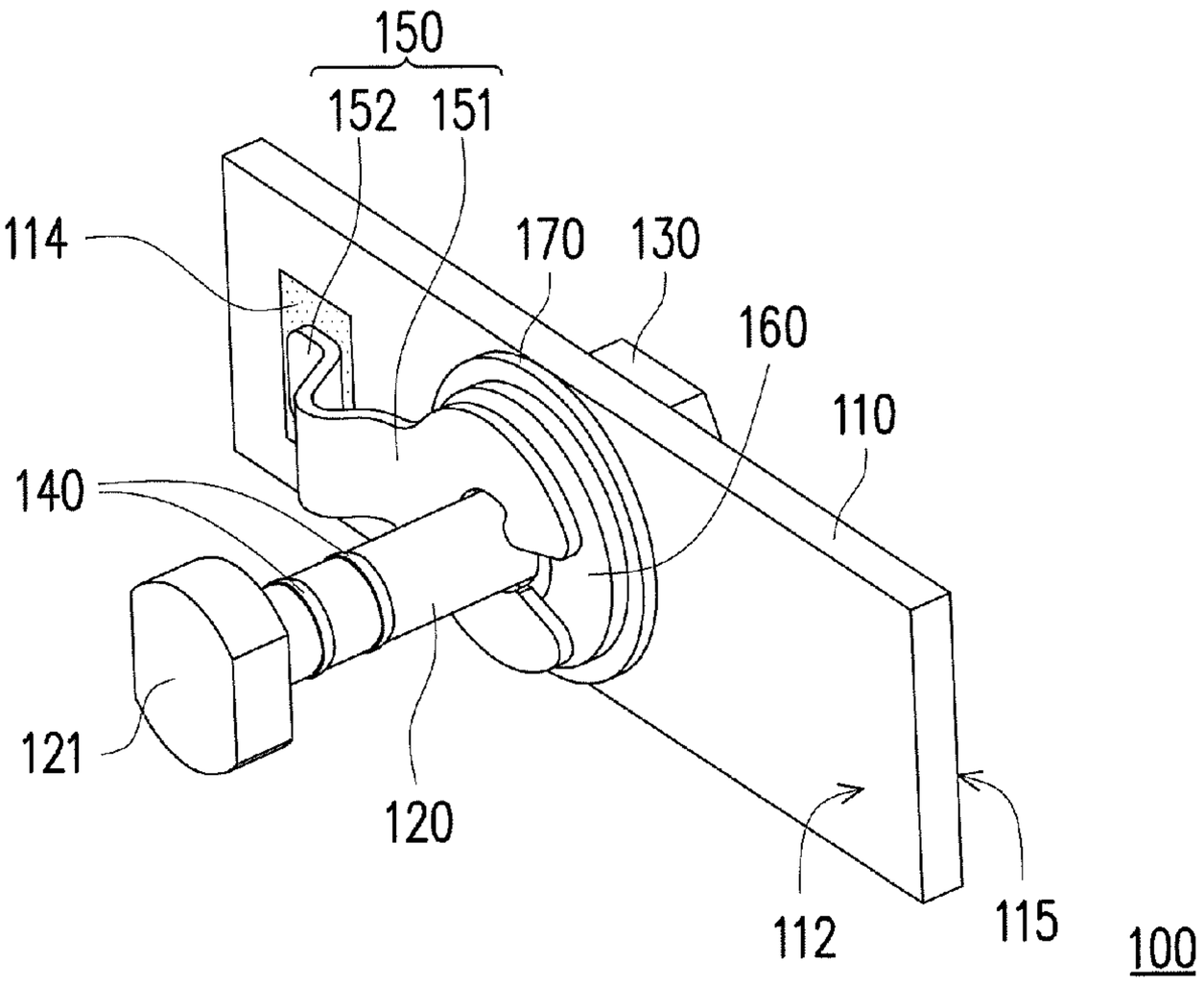

150
152
151
114
170
130
160
110
140
121
120
112
115
100

FIG. 3

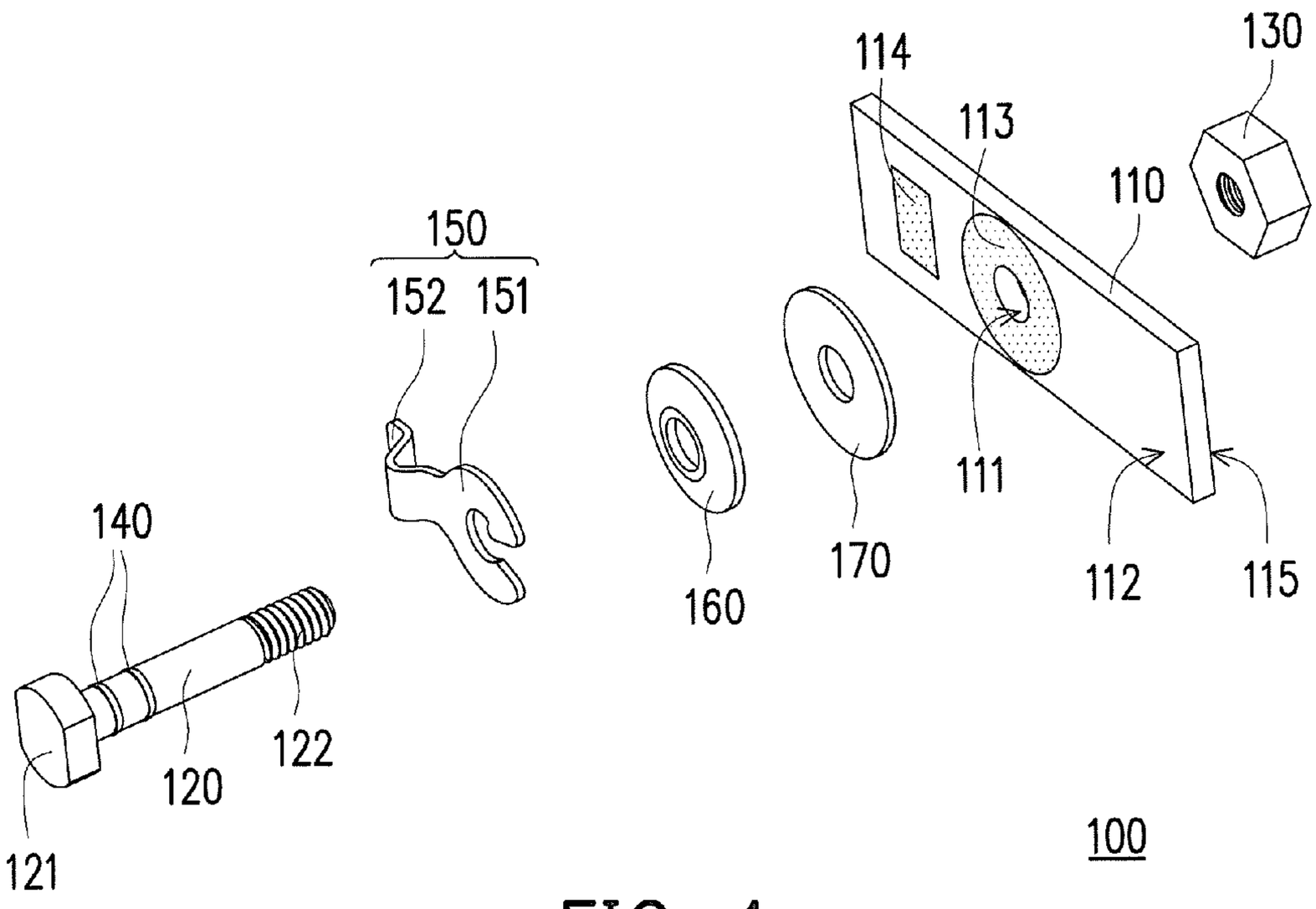

150
152
151
114
113
130
110
140
160
170
111
121
120
122
112
115
100

FIG. 4

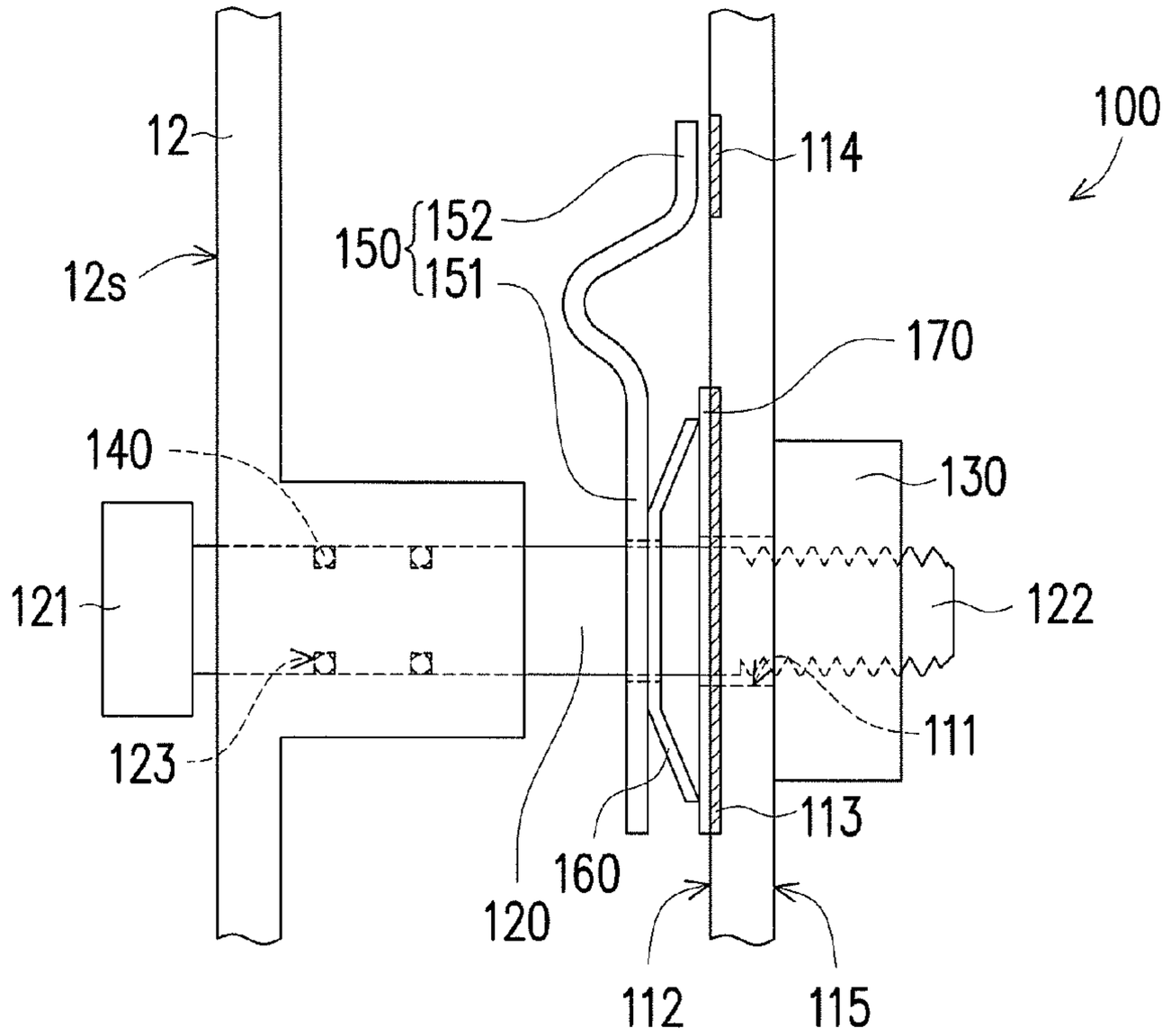

100
12
12s
150
152
151
114
170
130
140
121
122
111
123
113
160
120
112
115

FIG. 5

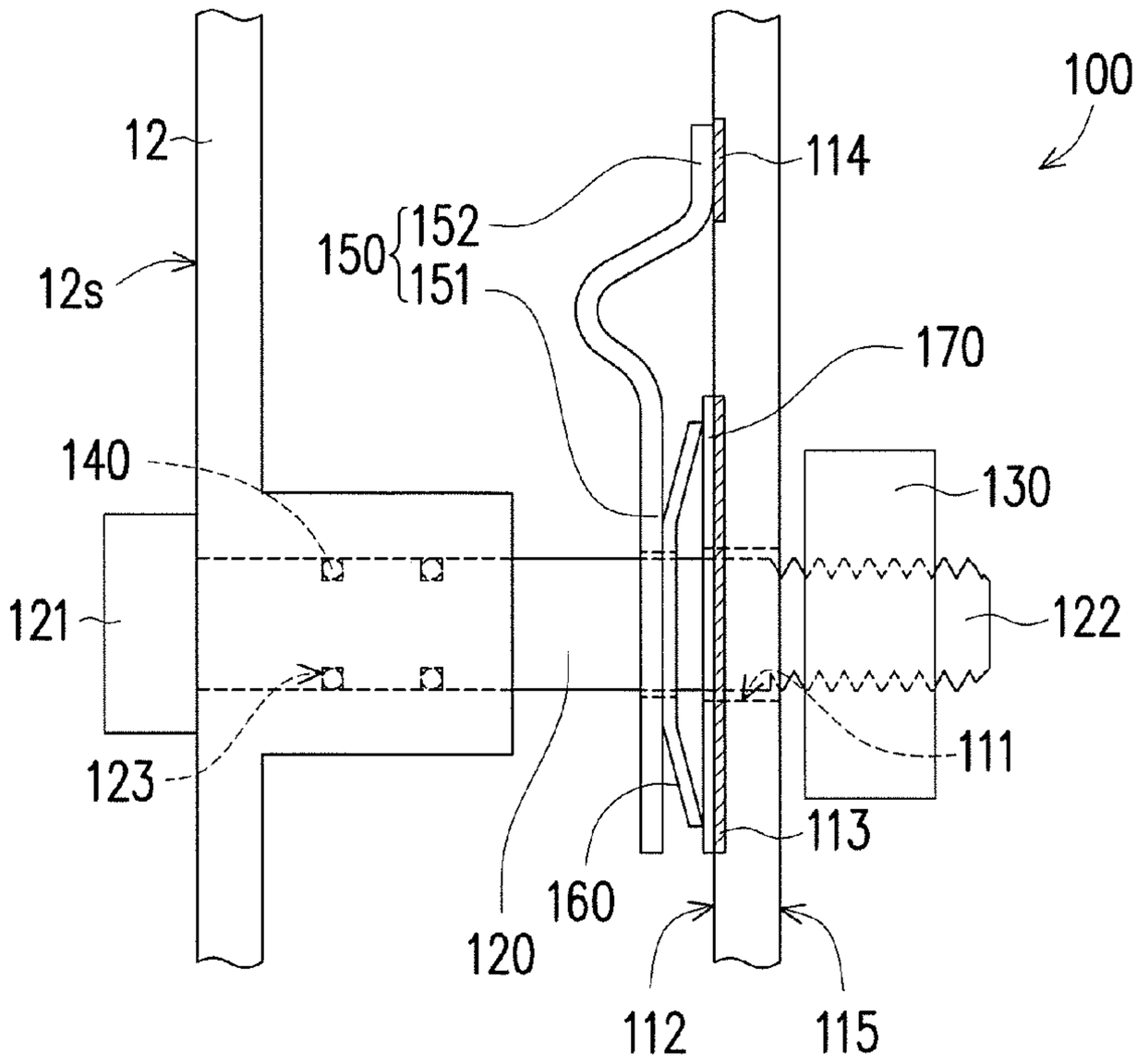

100
12
12s
150
152
151
114
170
130
140
121
122
111
123
113
160
120
112
115

FIG. 6

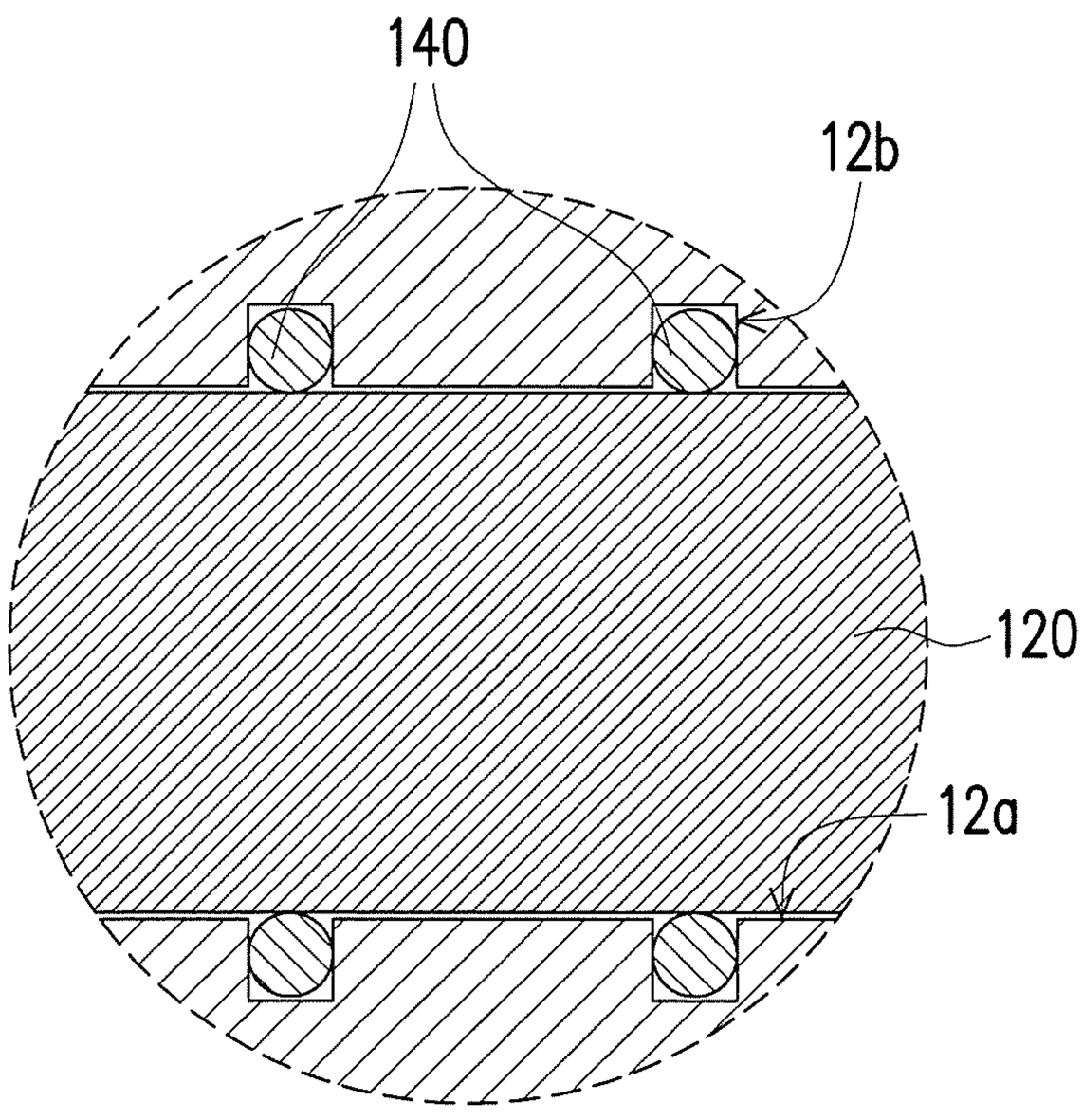


FIG. 7

KEY ASSEMBLY AND ELECTRONIC DEVICE

BACKGROUND

1. Technical Field

The application relates to a key assembly, and more particularly to an electronic device using the key assembly.

2. Description of Related Art

Recent years, technology products mostly set mobility and functionality as their main goal. Accordingly, portable electronic devices such as smart phones, tablet PCs and notebook PCs, etc. have become the mainstream products in the market of electronic devices.

In general, a portable electronic device is usually equipped with a key on the housing thereof, and a switch component corresponding to the key is disposed in the housing. The key and the switch component are coupled to each other, such that a user may control the switch component by pressing the key, so as to control switch such as power, Bluetooth or wireless network switch, or control function such as volume adjusting, images recording or display pages scrolling up and down, etc. In general, the housing of the portable electronic device has to be equipped with the corresponding opening to dispose the switch component for convenience in use. However, an overall size of the conventional switch component is rather large, and in order to let the switch component be contained in the abovementioned opening or let a part of switch component pass through the abovementioned opening, the size of the abovementioned opening cannot be effectively reduced. Accordingly, dust and moisture may easily enter the electronic device through the gap between the switch component and abovementioned opening, so as to affect the function of the electronic device, and even shorten the life span of the electronic device. Moreover, it is hard to meet the requirements in miniature design for portable electronic devices.

SUMMARY

The application provides a key assembly, which meets the requirements in miniature design.

The application provides an electronic device, which adopts the abovementioned key assembly to save the inner space for disposition, so as to meet the requirements in miniature design.

The application provides a key assembly, disposed at a housing of an electronic device. The housing has a first through hole. The key assembly includes a circuit board, a shaft, a limiting portion, a contact element and an elastic element. The circuit board is disposed on an inner side of the housing, wherein the circuit board has a second through hole, a first contact and a second contact. The shaft has a first end and a second end opposite to the first end. The shaft passes through the first through hole and the second through hole. The first end protrudes from an outer side of the housing, and the second end protrudes from the circuit board. The limiting portion is located at the second end of the shaft, so that the second end protrudes from the circuit board. The contact element is located between the housing and the circuit board and disposed on the shaft. The elastic element is coupled between the shaft and the circuit board. When the shaft drives the contact element to move toward the circuit board for the contact element to contact the second contact, the elastic element stores an elastic potential and the contact element is electrically connected to the first contact such that the second contact is electrically connected to the first contact through the contact element to generate an electrical signal.

The application further provides an electronic device which includes a body, a housing and a key assembly. The housing covers the body and has a first through hole. The key assembly is disposed at the housing. The key assembly includes a circuit board, a shaft, a limiting portion, a contact element and an elastic element. The circuit board is disposed on an inner side of the housing and has a second through hole. The circuit board has a first contact and a second contact. The shaft has a first end and a second end opposite to the first end. The shaft passes through the first through hole and the second through hole. The first end protrudes from an outer side of the housing, and the second end protrudes from the circuit board. The limiting portion is located at the second end of the shaft, so that the second end protrudes from the circuit board. The contact element is located between the housing and the circuit board and disposed on the shaft. The elastic element is coupled between the shaft and the circuit board. When the shaft drives the contact element to move toward the circuit board for the contact element to contact the second contact, the elastic element stores an elastic potential, and the contact element is electrically connected to the first contact such that the second contact is electrically connected to the first contact through the contact element to generate an electrical signal.

In light of the foregoing, the application provides a key assembly and an electronic device using the key assembly, wherein the shaft of the key assembly passes through the first through hole of the housing, such that the components such as the limiting portion, the contact element and the elastic element thereof are disposed in the housing so as to reduce the size of the first through hole. Accordingly, not only the requirement in miniature design of the electronic device can be met, but the possibility of moisture or dust from external environment entering the electronic device through the first through hole can also be reduce, so as to improve the life span and the reliability of the electronic device.

To be specific, the shaft passes through the second through hole of the circuit board at the same time. The contact element is located between the housing and the circuit board and clamps the shaft, and the elastic element is coupled between the shaft and the circuit board. When a user presses the part of the shaft protruding from the outer side of the housing, the shaft drives the contact element to move toward the circuit board, such that the contact element contacts the second contact of the circuit board. At the time, the second contact of the circuit board is electrically connected to the first contact of the circuit board through the contact element to generate an electrical signal, so as to actuate the corresponding control functions of the electronic device. Due to the key assembly of the application being highly integrated, an overall volume of the key assembly is effectively reduced, such that the electronic device using the abovementioned key assembly can achieve the goal of saving inner space for disposition, so as to meet the requirement in miniature design.

Several exemplary embodiments accompanied with figures are described in detail below to further describe the disclosure in details.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide further understanding, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments and, together with the description, serve to explain the principles of the application.

FIG. **1** is a schematic view illustrating an electronic device according to an embodiment of the application.

FIG. **2** is a cross-sectional view of the electronic device depicted in FIG. **1** along a sectional line A-A.

FIG. **3** is a schematic view of a key assembly depicted in FIG. **1**.

FIG. **4** is an exploded view of the key assembly depicted in FIG. **3**.

FIG. **5** is a partial perspective view of the location of the key assembly of the electronic device in FIG. **1**.

FIG. **6** is a schematic view of the key assembly depicted in FIG. **5** after operation.

FIG. **7** is a partial cross-sectional view illustrating an electronic device according to another embodiment of the application.

DESCRIPTION OF EMBODIMENTS

FIG. **1** is a schematic view illustrating an electronic device according to an embodiment of the application. FIG. **2** is a cross-sectional view of the electronic device depicted in FIG. **1** along a sectional line A-A. FIG. **3** is a schematic view of a key assembly depicted in FIG. **1**. For clearer illustration, it is noted that a part of the components disposed in the housing **12** are not depicted in FIG. **2**. Referring to FIG. **1** to FIG. **3**, in the present embodiment, the electronic device **10** includes a body **11**, a housing **12** and a key assembly **100**. The housing **12** covers the body **11** and has a first through hole **12***a*, and the key assembly **100** is disposed at the housing **12**. The electronic device **10** may be, for example, a mobile phone, a smart phone or a tablet PC, etc., and the housing **12** may be, for example, a plastic housing, a carbon-fiber housing or a complex housing composed of plastic and metal. Herein, the amount of the first through hole **12***a* may be, for example, one, and the first through hole **12***a* is located on a side wall **12***s* of the housing, but the application does not limit the location of the first through hole **12***a* on the housing **12**, and also not limit the amount of the first through hole **12***a*. They can be adjusted according to actual demands in design.

The following is a description directed towards the detailed structures of the key assembly **100**. In the present embodiment, the key assembly **100** is disposed at the housing **12**, and includes a circuit board **110**, a shaft **120**, a limiting portion **130**, a seal element **140**, a contact element **150** and an elastic element **160**. The circuit board **110** is disposed at an inner side of the housing **12** and has a second through hole **111**. In general, the circuit board **110** may be an inflexible printed circuit board or a complex circuit board, and the second through hole **111** may be formed on the circuit board **110** by processes such as etching or drilling, etc. The application is not limited thereto.

FIG. **4** is an exploded view of the key assembly depicted in FIG. **3**. Referring to FIG. **2** to FIG. **4**, the circuit board **100** further has a first surface **112** facing the housing **12**, and a first contact **113** and a second contact **114** located on the first surface **112**. To be more specific, the second through hole **111** substantially corresponds to the location of the first through hole **112***a*, and the first contact **113** is, for example, a circular pattern surrounding the second through hole **111**, and the second contact **114** is, for example, a rectangular pattern, but the application is not limited thereto. The types of the patterns of the first contact **113** and the second contact **114** can be modified according to actual demands in design. In general, the first contact **113** and the second contact **114** are, for example, a circuit pattern formed on the circuit board **110** by electroplating, halftone printing or spray printing, etc., and the material may be metal with high conductivity such as copper, gold, silver or nickel, etc. Even though the first contact **113** and the second contact **114** disposed on the same surface (i.e. first surface **112**) are illustrated herein, but the application is not limited thereto. Therefore, in other embodiment, the first contact **113** and the second contact **114** may be disposed on different surfaces on the circuit board **110** respectively.

The shaft **120** passes through the first through hole **12***a* and the second through hole **111** respectively, and has a first end **121** and a second end **122** opposite to the first end **121**. The first end **121** protrudes from an outer side of the housing **12** to function as a key for a user to press. The second end **122** protrudes from a second surface **115** of the circuit board **110**, wherein the second surface **115** is opposite to the first surface **112**. The limiting portion **130** is located at the second end **122** of the shaft **120**, and a size of the limiting portion **130** is greater than a size of the second through hole **111**, such that the second end **122** can be limited at a side of the circuit board **110** opposite to the second contact **114**, i.e. the side where the second surface **115** is located. In general, the limiting portion **130** is, for example, a screw nut locking to the second end **122** of the shaft **120**, or a limiting structure integrally formed with the second end **122** of the shaft **120**. The application is not limited thereto.

Comparing to conventional opening for containing the whole switch component in prior art, the size of the first through hole **12***a* can be effectively reduced since the first through hole **12***a* is merely configured for disposing shaft **120**, such that the requirement in miniature design can be met, and the possibility of moisture or dust from external environment entering the electronic device **10** through the first through hole **12***a* can also be reduced, so as to improve the life span and the reliability of the electronic device **10**.

Due to the size of the limiting portion **130** being greater than the size of the second through hole **111**, when the shaft **120** move toward outside from the housing **12**, the limiting portion **130** structurally interferes with the circuit board **110**, so that the second end **122** of the shaft **120** always protrudes from the second surface **115**, and prevents the shaft **120** from falling out of the housing **12** through the first through hole **12***a* after the shaft **120** and the circuit board **110** are separated.

The seal element **140** is disposed between the shaft **120** and an inner wall of the first through hole **12***a*, wherein the seal element **140** may be an O ring, but the application is not limited thereto. To be more specific, a groove **120** containing the O ring is disposed around an outer circumferential surface of the shaft **120**, such that the O ring can be limited in the groove **123** after being disposed on the shaft **120**, and would not be separated from the shaft **120** easily. Moreover, the O ring leans against the inner wall of the first through hole **12***a*, so moisture or dust from external environment can be blocked by the O ring, such that the life span and the reliability of the electronic device can be improved.

The contact element **150** is located between the housing **12** and the circuit board **110**, and the material may be metal with high conductivity such as copper, gold, silver or nickel, etc. In the present embodiment, the contact element **150** has a fix end **151** fixed to the shaft **120** and a free end **152** opposite to the fix end **151**, wherein the fix end **151** is, for example, a C-type retaining ring, such that the contact element **150** can clamp the shaft **120** by the C-type retaining ring. On the other hand, the free end **152** corresponds to the location of the second contact **114**, and the elastic element **160** is coupled between the shaft **120** and the circuit board **110**. Herein, the elastic element **160** is, for example, a conductive spring washer disposed between the fix end **151** of the contact element **150** and the first contact **113** of the circuit board **110**, and the shaft **120** passes through the spring washer.

On the other hand, the key assembly **100** further includes a spacer **170**. The spacer **170** is disposed between the spring washer and the first contact **113** of the circuit board **110**. The fix end **151** of the contact element **150**, the elastic element **160** and the spacer **170** are electrically connected to each other, and the spacer **170** is electrically connected to the first contact **113**. That is to say, in the present embodiment, the contact element **150** and the first contact **113** are electrically connected to each other by, for example, the elastic element **160** respectively leaning against the fix end **151** of the contact element **150** and the spacer **170**, and the spacer **170** contacting the first contact **113**. Herein, the shaft **120** can be made of non-conductive material such as plastic, acrylic or other suitable material, and the contact element **150** may, at first, not lean against the elastic element **160**, but may be electrically connected to the first contact **113** when the shaft **120** drives the contact element **150** to move toward the circuit board **110** to lean against the elastic element **160**, however, the application is not limited thereto. Herein, the elastic element **160** is illustrated as above as a spring washer, so as to achieve the purpose of saving the inner space of the electronic device **10** for disposition, and meet the demands in miniature design, but the application is not limited thereto. In other embodiments, the elastic component **160** may also be a compressive spring or other suitable elastic structure. Under a condition of the spacer **170** not being disposed, the elastic element **160** may also lean against the first contact **113** and the contact element **150** respectively, such that the first contact **113** and the contact element **150** are electrically connected to each other.

Even though the shaft **120** in the abovementioned embodiment is illustrated as being made of non-conductive material, in other embodiments, however, the shaft **120** may also be made of conductive material such as metal. Namely, the contact element **150** may be electrically connected to the first contact **113** through the conductive shaft **120** and the elastic element **160**. At the time, the fix end **151** of the contact element **150** may or may not lean against the elastic element **160**. The application is not limited thereto. For example, under a condition of the fix end **151** of the contact element **150** not leaning against the elastic element **160**, the conductive path between the contact element **150** and the first contact **113** is, for example, the contact element **150**—conductive shaft **120**—elastic element **160**—spacer **170**—first contact **113**, wherein it can be chosen to not dispose the spacer **170** and let the elastic element **160** lean against the first contact **113** instead.

FIG. **5** is a partial perspective view of the location of the key assembly of the electronic device in FIG. **1**. FIG. **6** is a schematic view of the key assembly depicted in FIG. **5** after operation. Referring to FIG. **5** and FIG. **6**, when the shaft **120** drives the contact element **150** to move toward the circuit board **110** for the free end **152** of the contact element **150** to contact the second contact **114**, the elastic element **160** is pushed by the fix end **151** of the contact element **150** and deformed, so as to store an elastic potential. Since the deformed elastic element **160** still respectively leans against the fix end **151** of the contact element **150** and the spacer **170**, the second contact **114** can still be electrically connected to the first contact **113** through the contact element **150**. Herein, the conductive path of the first contact **113** and the contact element **150** is illustrated as the elastic element **160** respectively leaning against the fix end **151** of the contact element **150** and the spacer **170**, and the spacer **170** contacting the first contact **113**. At the time, the shaft **120** can be made of non-conductive material such as plastic, acrylic or other suitable material, but the application is not limited thereto.

After the second contact **114** is electrically connected to the first contact **113** through the contact element **150**, the elastic element **160** and the spacer **170**, an electrical signal is generated, and the second contact **114**, the contact element **150**, the elastic element **160**, the spacer **170** and the first contact **113** which are electrically connected to each other can form an electrical loop. The abovementioned electrical signal may further transmit to the body **11** since the circuit board **110** and the body **11** are electrically connected to each other, such that the corresponding process unit (not shown) in the body **11** can generate a control signal according to the electrical signal, and the control signal may be, for example, power switch signal, volume adjustment signal or image scrolling signal, etc. After an electronic component (not shown) of the electronic device **10** receive the control signal described above, the electronic component (not shown) can be driven to execute the corresponding functions such as switching power on and off, turning volume up and down or scrolling images on display up and down, etc.

Next, when an external force applied on the first end **121** of the shaft **120** is removed, the elastic potential stored by the deformed elastic element **160** is released, so as to drive the elastic element **160** to restore to the initial status shown in FIG. **5**. At the time, the contact element **150** is pushed by the elastic element **160** to move along the direction away form the circuit board **110**, such that the free end **152** and the second contact **114** are separated from each other. At the time, a gap remains between the first end **121** and the housing **12** for the user to operate later on. Specifically, under the condition of the second contact **114** electrically connected to the first contact **113** without the help of the contact element **150**, the elastic element **160** and the spacer **170**, the abovementioned electrical signal is not generated and the abovementioned electrical loop is disconnected, so as to stop the electronic device **10** from executing the corresponding functions such as switching power on and off, turning volume up and down or scrolling images on display up and down, etc. When later the user presses the first end **121** of the shaft **120** to drive the contact element **150** to move toward the circuit board **110** for the free end **152** of the contact element **150** to contact the second contact **114**, such that the second contact **114** is electrically connected to the first contact **113** through the contact element **150**, elastic element **160** and spacer **170** to generate the electrical signal, the electronic device **10** can execute the corresponding functions again.

FIG. **7** is a partial cross-sectional view illustrating an electronic device according to another embodiment of the application, wherein the cross section thereof is substantially the same with the partial enlarged section shown in FIG. **2**. Referring to FIG. **7**, the method of disposing the seal element **140** of the electronic device is slightly different from the seal element **140** of the embodiment described above, and the differences fall in: the seal element **140** of the electronic device in FIG. **7** is, for example, fixed on an inner wall of the first through hole **12***a*. For instance, the seal element **140** can be fixed in a groove **12***b* of the inner wall of the first through hole **12***a*, and the shaft **120** is limited to the groove **12***b* after being disposed in the first through hole **12***a*, so it does not separate from the groove **12***b* easily. Moreover, the seal element **140** leans against an outer circumferential surface of the shaft **120**, so as to block moisture or dust from external environment by the seal element **140** and enhance the life span and reliability of the electronic device.

In sum, the application provides a key assembly and an electronic device using the same, wherein the shaft of the key assembly passes through the first through hole of the housing such that the components such as limiting portion, contact

element and elastic element, etc. can be disposed in the housing, and the size of the first through hole can be reduced. Thereby, not only the demands in miniature design for the electronic device can be met, but the possibility of moisture or dust from external environment entering the electronic device can be reduced, so as to enhance the life span and reliability of the electronic device.

To be more specific, the shaft passes through the second through hole of the circuit board at the same time, the contact element is located between the housing and the circuit board and clamps the shaft, and the elastic element is coupled between the shaft and the circuit board. When the user presses a part of the shaft protruding from an outer side of the housing, the shaft drives the contact element to move toward the circuit board for the free end of the contact element to contact the second contact of the circuit board. At the time, the second contact of the circuit board is electrically connected to the first contact through the contact element to generate an electrical signal, so as to actuate the corresponding control functions of the electronic device. Due to the key assembly of the application being highly integrated, an overall volume can be effectively reduced, such that the electronic device using the abovementioned key assembly can achieve the goal of saving inner space for disposition, so as to meet the requirement in miniature design.

Although the application has been described with reference to the embodiments thereof, it will be apparent to one of the ordinary skills in the art that modifications to the described embodiments may be made without departing from the spirit of the application. Accordingly, the scope of the application will be defined by the attached claims not by the above detailed description.

What is claimed is:

1. A key assembly, disposed on a housing of an electronic device and the housing having a first through hole, the key assembly comprising:

a circuit board disposed at an inner side of the housing and having a second through hole, a first contact and a second contact;

a shaft having a first end and a second end opposite to the first end, the shaft passing through the first through hole and the second through hole, the first end protruding from an outer side of the housing and the second end protruding from the circuit board;

a limiting portion located at the second end of the shaft, so that the second end protrudes from the circuit board;

a contact element located between the housing and the circuit board, the contact element is disposed on the shaft; and

an elastic element coupled between the shaft and the circuit board, wherein the elastic element and the contact element are two separate elements, the elastic element disposed between the contact element and the circuit board, when the shaft drives the contact element to move toward the circuit board for the contact element to contact the second contact, the elastic element stores an elastic potential, and the contact element is electrically connected to the first contact such that the second contact is electrically connected to the first contact through the contact element to generate an electrical signal.

2. The key assembly as claimed in claim **1**, wherein the circuit board has a first surface facing the first through hole, and the first contact and the second contact are located on the first surface.

3. The key assembly as claimed in claim **1**, further comprising:

a seal element, disposed between the shaft and an inner wall of the first through hole, wherein the seal element comprises an O ring.

4. The key assembly as claimed in claim **3**, wherein the seal element is fixed on the shaft, a groove containing the seal element is disposed around an outer circumferential surface of the shaft.

5. The key assembly as claimed in claim **1**, wherein a size of the limiting portion is greater than a size of the second through hole.

6. The key assembly as claimed in claim **3**, wherein the seal element is fixed to an inner wall of the first through hole, a groove containing the seal element is disposed around an inner surface of the inner wall.

7. The key assembly as claimed in claim **1**, wherein the contact element has a fix end fixed to the shaft and a free end opposite to the fix end, and when the shaft drives the contact element to move toward the circuit board, the free end contacts the second contact.

8. The key assembly as claimed in claim **7**, wherein the fix end of the contact element comprises a C-type remaining ring, the C-type remaining ring clamps the shaft.

9. The key assembly as claimed in claim **1**, wherein the elastic element is a spring washer, disposed between the contact element and the circuit board, and the shaft passes through the spring washer.

10. The key assembly as claimed in claim **9**, further comprising:

a spacer disposed between the spring washer and the first contact of the circuit board and electrically connected to the contact element and the first contact.

11. An electronic device, comprising:

a body;

a housing covering the body and having a first through hole; and

a key assembly disposed at the housing, the key assembly comprising:

a circuit board disposed at an inner side of the housing and having a second through hole, a first contact and a second contact;

a shaft having a first end and a second end opposite to the first end, the shaft passing through the first through hole and the second through hole, the first end protruding from an outer side of the housing and the second end protruding from the circuit board;

a limiting portion located at the second end of the shaft, so that the second end protrudes from the circuit board;

a contact element located between the housing and the circuit board, the contact element is disposed on the shaft; and

an elastic element coupled between the shaft and the circuit board, wherein the elastic element and the contact element are two separate elements, and the elastic element disposed between the contact element and the circuit board, when the shaft drives the contact element to move toward the circuit board for the contact element to contact the second contact, the elastic element stores an elastic potential, and the contact element is electrically connected to the first contact such that the second contact is electrically connected to the first contact through the contact element to generate an electrical signal.

12. The electronic device as claimed in claim **11**, wherein the circuit board has a first surface facing the first through hole, and the first contact and the second contact are located on the first surface.

13. The electronic device as claimed in claim 11, wherein the key assembly comprises:

a seal element disposed between the shaft and an inner wall of the first through hole, wherein the seal element comprises an O ring.

14. The electronic device as claimed in claim 13, wherein the seal element is fixed on the shaft, a groove containing the seal element is disposed around an outer circumferential surface of the shaft.

15. The electronic device as claimed in claim 11, wherein a size of the limiting portion is greater than a size of the second through hole.

16. The electronic device as claimed in claim 13, wherein the seal element is fixed to the inner wall of the first through hole, a groove containing the seal element is disposed around an inner surface of the inner wall.

17. The electronic device as claimed in claim 11, wherein the contact element has a fix end fixed to the shaft and a free end opposite to the fix end, and when the shaft drives the contact element to move toward the circuit board, the free end contacts the second contact.

18. The electronic device as claimed in claim 17, wherein the fix end of the contact element comprises a C-type remaining ring and the C-type remaining ring clamps the shaft.

19. The electronic device as claimed in claim 11, wherein the elastic element is a spring washer, disposed between the contact element and the circuit board, and the shaft passes through the spring washer.

20. The electronic device as claimed in claim 19, wherein the key assembly further comprises:

a spacer disposed between the spring washer and the first contact of the circuit board, and electrically connected to the contact element and the first contact.

* * * * *